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## RECENT ADVANCES IN ZOOLOGY;

WITH ESPECIAL REFERENCE TO THE ORIGIN OF THE VERTEBRATA.

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WHEN I undertook to deliver a lecture with the title of "Recent Advances in Zoology," I hardly estimated how much of what is already well known would have to be told you, if you were to understand the value of our later progress. For this reason I shall have to confine myself to that group to which we belong ourselves, and which is, consequently, that which most powerfully interests us all. What I shall now deal with seem to be *real* advances, not forced or feigned marches, but deliberate attacks on what is unknown. These advances seem to be real, these attacks seem to be deliberate, because they are the result of guiding and directing philosophical principles.

A quarter of a century ago it would have been impossible to premise a lecture with a title such as that which has been chosen, with remarks such as those I have just made. Advances in knowledge there were; accumulations of facts were then overwhelming. But there was no co-ordination, there was no general leading, there were no forces animating men's minds to work together towards one great end.

Now, however, there is co-ordination, the spirit if not the person of the general is with us still, and well-ordered speculation has taken the place of scholastic generalities.

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\* A lecture delivered at the Zoological Society's Gardens in the course of "Davis Lectures," 2nd July, 1885.

I need not tell you how this has happened; how Charles Darwin "found a great truth trodden under foot . . . and ridiculed by all the world" (Huxley); but I may, perhaps, remind you that the outcome of the 'Origin of Species' was the conviction that, in Zoology, truth is only to be found when the doctrine of the blood-relationship of Animals is steadfastly borne in mind. And I hope to show you that this animating principle has not only excited investigators, but linked their results into coherence, if not into truth. I do not propose to weary you by taking you into details which are of interest only to the worker in a special field; I shall speak only of such discoveries, and of their apparently logical results, as will, I hope, prove to be of interest to zoologists generally.

And, firstly, as to the broadest classification of the Animal Kingdom; that which we are in the habit of using is the Lamarckian grouping of Vertebrata and Invertebrata; but it is one which to-day no competent zoologist would ever dream of teaching! I do not doubt that it will be continued to be used by Man, as a mark of the distinction between Man and his zoological allies, on the one hand, and "the rest" on the other. But it is, nevertheless, one which denies or neglects the greatest results of modern inquiry. It is one which expresses the beliefs of just half-a-century ago; for it was in 1835 that that great anatomist and physiologist, Johannes Müller, quoted with approval the words of Kant, "The cause of the particular mode of existence of a living body resides in the whole"; but it neglects a doctrine which is nearly fifty years old, too,—the doctrine of the great Belgian biologist, Theodor Schwann, that animal cells are independent in their mode of growth. This doctrine of Schwann's made steady progress, and the cellular composition of the higher animals was, long since, unreservedly accepted.

But the teachings of anatomists and microscopists remain limited to a narrow circle until they are used for the purposes of systematic classification, and it was not till 1866 that the logical result of our knowledge that some animals and some plants are composed of a number of cells which are united in a common organism, and subserve its different functions, led Prof. Haeckel to institute a third division of the Kingdom of Animated Nature, and to speak of Animals, Plants, and Protista, or first organisms, neither truly animal or vegetable.

Let me turn aside for one moment to point out two results, the one of practical, the other of philosophical interest, which flowed from this new classification. And I take them in the order of first practical, and next philosophical, because it is thus that they have affected men's minds.

The practical result is this, that teachers are not now satisfied with making their students either botanists or zoologists; they attempt to make them biologists; that is to say, they endeavour to make them acquainted first of all with the characteristic phenomena of Living Matter, and that it is in the second place only that they direct their attention to Animals, as such, or Plants, as such. And the philosophical result, as has been so well pointed out by Mr. Geddes in his recent article on 'Morphology,' is this—we have returned to Linnæus' first conception of the classification of the material world; we think now of Organized things on the one hand, and of Non-organized on the other. The relation of Animals and Plants is recognised to be closer than it is supposed to be for the last century; and the formal reason has been to be found in the fact that both Animals and Plants have ancestors common to themselves, but not common also to Minerals; these ancestors are to be sought for among the Protista.

Prof. Haeckel has quite recently extended and formulated this view by uniting together into the group of Histiota all Animals and Plants that form tissues or cell-aggregates, urging that the difference between Protista and Histiota is greater than that between Animals and Plants. This is a view expressed too lately to come within the purview of acknowledged advances, but it is one that will, no doubt, be first of all hotly debated, and, later on, silently accepted.

So far, indeed, as Animals are concerned the principle of the matter was yielded ten years ago; for it is now but a few months more than a decade that Prof. Huxley read to the Linnean Society an essay on the classification of the Animal Kingdom. Allow me, before we go further, to remind you that Prof. Huxley is one of those generals who do not fight far in advance of their base; or, in other words, that the systematic generalizations which he proposes or accepts have always behind them a very solid array of well-matured facts. Ten years ago, then, Prof. Huxley distinguished between such animals as never formed tissues, and

those whose eggs, breaking up into cells, gave rise from those cells to distinct tissues. For the former he retained the old name of Protozoa, or first animals; for the latter he accepted and endorsed the Haeckelian term of Metozoa, or animals that came *after* the Protozoa. Using less objective terms, Maupas has recently suggested that we should speak of Cytozoa, or cell-animals, and Histoza, or tissue animals. The change, however, is not needed, and, as I hope to show you, we are on the eve of changes enough.

If you have gone with me so far you will have seen that the case against the Vertebrata and Invertebrata as representing the two prime divisions of the Animal Kingdom is now complete; allow me so far to comfort you as to assure that neither Cuvier, the father of comparative anatomy, nor von Baer, the father of embryology, ever accepted or endorsed this classification.

I must beg to offer you what consolation I have at my disposal, for I am now going to ask you to go a step further, and to give up altogether, on the pain of losing your characters as well-informed zoologists, the appellations of Vertebrata and Invertebrata!

I will first of all remind you of the history of the facts of the case, and will do so because you cannot hope to form a judgment on this subject, any more than on any which is of political interest, unless first of all you are led step by step through the processes by which opinion became formed.

In 1864 Prof. Huxley published a classification of animals, which he would now be the first to call antiquated; in this there was a division of Mollusca-like animals (Molluscoida), one of the three groups of which was that of the Ascidians. In 1867 the distinguished Russian embryologist Kowalevsky published an account of his investigations into the early history of the mode of formation of the organs of the Ascidian body, which resulted in spanning the gulf between Vertebrates and Invertebrates in an altogether unexpected manner. Kowalevsky showed that in Ascidians, just as in 'Vertebrates,' the central nervous system arises by the formation of a dorsal groove, the sides of which gradually closed over, met and formed a dorsal neural tube, whereas in other high 'Invertebrates' the central nervous system arises as a solid thickening of the ventral middle-line, which gradually sinks away from the surface, but is never hollow, and never folded



on itself. Nor is this all; the ventral system needs no support, the dorsal, lying above the cavity of the body, needs to be supported; in all 'Vertebrates' this support primarily consists of a solid unjointed rod—the dorsal rod or notochord; such a notochord was found by Kowalevsky to be developed also in the Ascidians.

Two results, then, were arrived at, and, as you do not all know the works of Kowalevsky, I may add—what would be quite unnecessary in a less general company—that the distinguished Russian's statements have been found by other naturalists to be exactly and perfectly correct. These results were—

1. That a notochord was not confined to 'Vertebrates'; and
2. That the central nervous system of Tunicates was formed in just the same way as in 'Vertebrates.'

You may be sure that these results of Kowalevsky were not at first accepted; to use the words of Prof. Kupffer, who wrote with the honest bluntness of Prince Bismarck's countrymen, they did not "seem to be generally taken as trustworthy"; the Professor owns that he himself was sceptical, but his scepticism was of the kind which a countryman greater still than Prince Bismarck had called an "active scepticism," or which, as Goethe explains, has for its sole object that of conquering itself. To this important and thoroughly scientific duty Kupffer devoted himself in 1869, and his testimony and the weight of Prof. Haeckel's opinion began to work a revolution in Systematic Zoology, which has not yet expended its influence.

The value of a discovery in science is not to be gauged merely by the additions which it makes to knowledge; science, as Plato long ago taught, consists not in the passive perception of facts, but in the reasoning upon them; or, to use the words of Berkely, with regard to that Greek philosopher, the man of science is the greater the more "fine hints sparkle and shine throughout his writings."

Now, what are the kind of considerations that arise when we reconsider the 'Vertebrata' by the light of Kowalevsky's discovery; first of all this, that among the 'Vertebrata' there is one remarkable form—the Lancelet (*Amphioxus*)—in which the central nervous system is a hollow tube, and in which this tube is supported by a notochord, but is never protected by cartilaginous or bony rings developed around it. In other words, the zoologist comes to the conclusion that he has outdone

even M. Jourdain, for while that immortal bourgeois had spoken prose for forty years without knowing it, the zoologist has for half a century called vertebrate an animal with no vertebræ at all.

This reconsideration of known facts has resulted in some, and in time, I doubt not, they will be followed by all, systematic zoologists, calling that great aggregation of forms to which belong Man, the Hawk, the Snake, and the Lancelet that of the Chordata, instead of that of the Vertebrata.

It was about this time (in 1868) that Prof. Huxley enunciated certain principles which are of very great importance in Systematic Zoology; and they are to be found in one of the volumes of 'The Ibis,' which was at that time under the editorship of Prof. Newton, and in a letter in which Prof. Huxley defends himself against the criticism of that accomplished ornithologist.

The part of the letter to which I wish you to pay attention runs thus:—

“Further, it must be recollected that the diagnosis of a group may rest not merely on a particular character confined to the group, but on a peculiar combination of characters.

“And it may happen that a well-defined group shall not have a single structural feature peculiar to itself, its peculiarity lying entirely in the mode of combination of those features.”

You will ask, perhaps, where is the combination of characters on which Prof. Huxley insisted; you will say that, the presence of a notochord being a necessity for a dorsal nerve-cord, the fact of the co-existence of these two organs is not a matter of much importance. I need not discuss this objection with you, for I am willing, at least, to pass it by; for this is yet another organ—that, namely of respiration—which is formed in just the same way in Vertebrates and Ascidians. In all the Vertebrata we find that there appear at the sides slits or clefts formed by the inpushing of the layer of cells on the outer surface of the body; these slits are met by outgrowths of the layer which lines some of the anterior portion of the digestive tract; the outgrowths and ingrowths meeting fuse, and give rise to a passage from the tract to the exterior. In fishes and in some—or for part of their lives all—Amphibians these slits serve as a means of passage for the water of respiration, which, entering by the mouth, bathes the slits, in the walls of which blood-vessels are well

developed, and makes its way to the exterior through their openings.

This view of the importance of a combination of characters has widely extended itself among zoologists, and has led to valuable results in other divisions of the Animal Kingdom than that of Vertebrata; but of these I shall hardly have time to speak to you to-day.

Startling as is the doctrine that the Vertebrates and some of Prof. Huxley's Molluscoids are intimate allies, I must now ask you to consider the possibility of your zoological affinities with members of the still lower group of what are ordinarily called Worms.

I will do my best to save your feelings of self-respect by introducing you first of all to a distant cousin, who has at least this regard for his more distinguished relatives, that he has quite cut himself off from all the rest of the mob which zoologists call 'Vermes' or Worms. More than this, he has a very high-sounding name indeed—it is *Balanoglossus*; and he has a thoroughly respectable name-father in the distinguished Italian naturalist Delle Chiaje.

It has long been known that this worm, which lives in sandy or muddy places, takes in water by its protusible proboscis, and passes it out through slits, which lie on either side of the anterior part of the body; and that these breathing-slits or gill-slits are, in all their essential morphological characters, justly comparable to the gill-slits of Fishes. This is a fact which is so thoroughly recognised that some time ago we had a diagram prepared for exhibition in the galleries of the new Natural History Museum at South Kensington. Curiously enough, on the very day on which I put into position that picture, and its appended label of "A Worm that breathes by gills, like a Fish," Mr. William Bateson, of St. John's College, Cambridge, read a paper before the Royal Society which gave a new aspect to the relationships of *Balanoglossus*.

Mr. Bateson has had exceptionally good opportunities for studying the history of this form,—we had better at once cease to call it worm,—owing to the excellent arrangements for marine laboratories which now obtain in the United States, and the hospitalities of their distinguished directors.

Mr. Bateson has been able to observe the development of

a dorsal rod, the microscopic structure of which is precisely comparable to that of young Lampreys, or young Sharks, and which he has no hesitation in calling a notochord; he finds that the central nervous system is dorsal and forms a hollow tube, and as to the gill-apparatus he tells us that it may be well compared to that of *Amphioxus*; just as in the Lancelet, the gill-slits increase in number from before backwards during life. There are other points of resemblance, but those which I have indicated are sufficient for our purpose to-day.

These observations appear to justify the inclusion of *Balanoglossus* in that great trunk of the animal tree which is called the Chordata, which will then, as Mr. Bateson suggests, consist of four groups:—

1. Hemichordata (Enteropneusti).
2. Urochordata (Ascidians).
3. Cephalochordata (*Amphioxus*).
4. Vertebrata.

Having now brought the origin of the vertebrate stock so far down in the ancestral tree, we may as well see if we cannot trace it yet a little further. If the views of Metschnikoff are just, *Balanoglossus* is most closely allied to the Echinodermata, or Starfishes and Sea-Urchins; this view, however, is too problematical for us to be able to regard it as an acquired fact in Zoology, and, so far as general audiences are concerned, it can only be mentioned as affording an opportunity for repeating the humorous remark of my friend and colleague Prof. Martin Duncan, that the highest Vertebrate is always an Urchin in his earlier days.

We can, however, trace the Vertebrate far and deep into the vermicular world. One division of the lowest groups of worms, the Nemertinea, are remarkable for the possession of a proboscis which can be protruded from an orifice in front of the mouth, and be withdrawn into a sheath which lies above the digestive canal; now this sheath lies in the dorsal middle line, or, in other words, occupies an exactly similar position to the notochord, and, so far as is known, in developmental history the notochord and the sheath appear to have much in common. Let this be the first point.

Nearly all the Vertebrata have on the lower surface of their brains a body which, in the highest group of all,—or that of the



Mammalia,—becomes actually fused with the brain itself; when thus fused it appears to be a downgrowth—or *hypophysis*—of the brain, and it has acquired the distinctive term of the *hypophysis cerebri*. But, although thus connected with the brain, the downgrowth in question has had a very different history to the great mass with which it has finally entered into relation. It was at first an upgrowth of the roof of the pit which goes to form the mouth, but its stalk becomes gradually nipped out, and the formation of the cartilaginous or bony palate separates it from the cavity from which it sprung.

In the lowest of Vertebrates—or in those in which there are no true jaws—the so-called Round-mouths, like the Lamprey and the Hag, the *hypophysis cerebri* does not arise directly from the roof of the pit which forms the mouth, but appears as an independent pit in the front of the mouth.

Now, as to the Nemertines: the proboscis, which is invested by the sheath, ordinarily arises as an ingrowth in front of, or independently of, the mouth, just as does the *hypophysis cerebri* in the Lampreys; but in two genera of Nemertines (*Akrostomum* and *Malacobdella*) it appears as an outgrowth of the roof of the mouth—or, in other words, is developed in just the same way as the *hypophysis cerebri* of most Vertebrates. Let these form our second sets of facts.

If we have found some plausibility in the appearance of resemblance between the proboscis-sheath and the notochord, it is clear that our case will be made very much stronger if we can see anything in the Nemertine which will correspond to gill-slits.

On either side of the anterior end of the body of a Nemer-tean worm we observe a structure which, varying somewhat in character, may be spoken of as a sac, a furrow, or a groove. The sides of this organ are ciliated, and are, therefore, able to set in movement any body, such as water, which may enter them; the groove is sometimes continued into a canal which passes into the substance of the nerve-cells of the brain. These cells are impregnated with a substance which gives them a reddish-yellow colour, and which has been found to be hæmoglobin—or that substance which gives the reddish-yellow colour to our blood-corpuscles, and which is known to be capable of storing up oxygen, or of acting as a respiratory pigment. Now the ciliated ducts bringing in water bring in a fresh supply of oxygen, and

thereby give a fresh store to the hæmoglobin. They are, therefore, respiratory ducts, just like the gills of *Balanoglossus*, of *Amphioxus*, or the Salmon.

Functionally, then, they are similar; but what about the structural resemblances? Gills, you will remind me, are made not only by inpushings from without, but by outpushings from within, which meet and fuse with the inpushings. Well, such a thing does obtain among the Nemertinea, too; the mass of cells into which the canals from without extend are derived primitively from the walls of the œsophagus.

Let these make our third point, or rather, the third point of Prof. Hubrecht. When we come to sum them up shortly we may state our points thus:—

(1). Nemertean worms have a hollow structure which in position, and possibly in developmental history, agrees with the notochord of the Chordata.

(2). The proboscis of most Nemertines has the same relations as the *hypophysis cerebri* of some Chordata, and that of a few Nemertines the same as that of most Chordata.

(3). Laterally placed respiratory grooves in some Nemertines come into relation with outgrowths from the wall of the œsophagus.

Before accepting the justice of the conclusions to which we seem to be led, let us repeat the scientific version of Danton's famous saying about the orator, "De la doute, encore de la doute, et toujours de la doute."

Are there no difficulties remaining? You will see one in a moment, I hardly doubt. You will say that while Chordates have the nerve-cords placed dorsally, all worms have them placed ventrally; and you would be almost correct, yet not quite.

Among all the remarkable discoveries which have been made in the quarter of a century that has elapsed since Mr. Darwin published his 'Origin of Species,' none are of greater value or significance than those which affect our knowledge of the evolution of the nervous system of animals.

The simplest forms, such as *Amœba*, have no nervous system at all, but the whole surface of their body shows itself able to respond to external stimuli; in the lowest group of the Metozoa, the Sponges, a nervous system is, also, said to be absent. But this is not correct; Prof. Charles Stewart has found that the

orifices by which the canals of our common Calcareous Sponge (*Grantia compressa*) communicate with the exterior are fringed with delicate hair-like processes which taper to a fine point; each hair appears to be in relation to an underlying cell, which sends out a delicate process which traverses the axis of the hair-like process. This apparatus is judged by Prof. Stewart to be one which is specially adapted for being impressed by varying conditions in the intrushing water; these changes possibly lead to the contraction of the surrounding cells, so that we have here a mechanism by means of which the extent of the incurrent canal may be increased or diminished.

In the next group of animals we have a number of stages in the development of sense-organs, and a number of jelly-fish are, without doubt, provided with means by which they can distinguish between light and darkness. But there are not only sense-organs situated on the surface; there is, also, just below the under surface of the disc or umbrella, a network of nerve-fibres which extends in an apparently irregular fashion through its whole extent. In other words, when a nervous system first appears it is superficial in position and scattered in arrangement.

As the nerve-fibres become more and more concentrated they become arranged in a smaller number of definite bundles, which we are in the habit of calling nerve-cords. Of these there may be, as Gaffron has lately found in one of the Flukes (*Distomum isostomum*), six cords, a pair of which are dorsal, a pair of which are lateral, and a pair of which are ventral in position. Now, of these, it is quite clear that future circumstances would alone determine which were to gain the supremacy, and become the dominant pair; to put it in another way, such a fluke might have three sets of descendants in which a dorsal, a lateral, or a ventral pair would alone be found.

The Nemertinea carry us a step further in our argument; while *Carinella* has its nerve-cord lying outside the muscular wall of the body and just beneath the integument, *Cerebratulus* has its nerve-cords lying in the midst of its muscular walls, and *Amphiporus* has them internal to the muscles; but in all these three cases the cords lie midway between the dorsal and the ventral surface of the body; they are lateral in position.

In most 'Invertebrates' the cords finally take up a ventral position; but this is not always altogether the case.

When we examine that remarkable form *Peripatus*,—the true position of which has been made clear by the discoveries of Prof. Moseley and of the late Francis Balfour, and of which I had hoped to have had time to speak to you to-day,—we find a nervous system which is in many remarkable points of an exceedingly primitive character. The single point to which I can now direct your attention is this: at the hinder end of the body the two nerve-cords, which lie on the ventral surface, are connected with one another by a band which lies above the intestine, or which is, in other words, dorsal and not ventral in position.

From all this it will be clear to you that the difference in the position of the nerve-cords in two highly developed animals is not a weighty argument against these two forms having had one common ancestor whose nerve-cords were like those of many of the Nemertinea, lateral in position.

If I have made myself clear in the exposition of the facts which I have brought before you I must have led you, first of all, to the conclusion that the Vertebrates are not sharply distinguished or separated from another great division of the Metazoa, and that what has often been regarded as an insoluble problem may before long be made much clearer.

Another result is this: the ancestors of Vertebrates are to be sought for in worm-like forms living on the sea-coasts, or, to use more technical language, in our littoral marine fauna. If this be true you will not wonder that many of us have during the last two or three years been giving a great deal of time and thought to try and get built a laboratory for investigation on our sea-shores; the ancient philosopher, such as Lucretius, found it pleasant to stand on the sea-shore and watch the mariners in distress; the modern philosophical naturalist wants to stand on the sea-shore that he may study the anatomy and the activities of those animals that seem to offer him the key to the structures of higher forms, that he may see the beginnings of that stock which has found one of its culminations in Man.

And, to conclude, I hope I have made it clear to you that, though these recent discoveries have effected a revolution in the ideas in which we were educated, they have been, after careful enquiry, generously accepted. If I have done this, I have done yet more; I have proved to you that the man of science does not



only profess truth, but seeks after it, and that he is willing to give up even cherished systems when they have been found to be out of accord with fact. Ten years hence, men may scoff at what I have been telling you to-day, for Science, and especially the science of organised Nature, is just now advancing with leaps and bounds, and the truths of to-day may be the fables of to-morrow. So long as we bear this in mind, so long as we are willing to incorporate new truths whencesoever they may come, so long shall we be able to speak of, and hope for, advances in Zoology.

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#### THE FAUNA OF THE SEASHORE.\*

THE marine fauna of the globe may be divided into the littoral, the deep-sea, and the pelagic faunas. Of the three regions inhabited by these faunas, the littoral is the one in which the conditions are most favourable for the development of new forms through the working of the principle of natural selection. As Prof. Lovén writes, "The littoral region comprises the favoured zones of the sea where light and shade, a genial temperature, currents changeable in power and direction, a rich vegetation spread over extensive areas, abundance of food, of prey to allure, of enemies to withstand or evade, represent an infinitude of agents competent to call into play the tendencies to vary which are embodied in each species, and always ready by modifying its parts to respond to the influences of external conditions." It is consequently in this littoral zone where the water is more than elsewhere favourable for respiration, and where constant variation of conditions is produced by the tides, that all the main groups of the animal kingdom first come into existence; and here also, probably, where the first attached and branching plants were developed, thus establishing a supply of food for the colonisation of the region by animals.

The animals inhabiting the littoral zone are most variously modified, to enable them to withstand the peculiar physical con-

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\* Abstract of lecture at the Royal Institution by Prof. H. N. Moseley, M.A., F.R.S.

ditions which they encounter there. Hence the origin of all hard shells and skeletons of marine Invertebrata, various adaptations for boring in sand, the adoption of the stationary fixed condition, and similar arrangements. Almost all the shore forms of animals, however inert in the adult condition, pass through in embryological development free-swimming larval stages which are closely alike in form for very widely different groups of animals. Thus the Oyster and most other Mollusca of all varieties and shapes when adult develop from a free-swimming pelagic trochosphere larva, and so do many annelids. Such larvæ cannot be of subsequent origin to the adults of which they are phases. If such were the case they would not have become so closely alike in structure. In reality they represent the common ancestors from which all the forms in which they occur were derived, and as all these larvæ are pelagic in habits and structure, it follows that the inhabitants of the shores were derived from pelagic ancestors. The earliest plants were also probably free-swimming.

In the case of the Cirripedia there can be no doubt, from the history of their development, that they were originally pelagic, and have become specially modified for coast life; and in the case of the echinoderms the only possible explanation of the remarkable similarity of the larval forms of the various groups of widely differing adults is that these pelagic larvæ represent a common ancestor of the group. The madreporarian corals all spring from a pelagic larvæ. The colonial forms probably owe their origin and that of their skeletons to the advantage gained by them in the formation of reefs, and the increase in facilities of respiration consequent on the production of surf. In the deep sea they are very scarce.

The Vertebrata are sprung from a very simple free-swimming ancestor, as shown by the ciliated gastrula stage of *Amphioxus*. The Ascidians afford another evident instance of the extreme modification of pelagic forms for littoral existence.

The pelagic mode of respiration of Vertebrata by means of gill-slits occurs in no other animal group except in *Balanoglossus*, which will probably shortly be included amongst Vertebrata. Possibly gill-slits as a respiratory apparatus first arose in a littoral form, such as *Balanoglossus*, and hence their presence at the anterior end of the body, that nearest to the surface in an animal buried in sand. The connection of *Balanoglossus* with

the Echinoderms through *Tornaria* is very remarkable. Possibly *Amphioxus* once had a *Tornaria* stage, and has lost it just as one species of *Balanoglossus* has lost it, as Mr. Bateson has lately discovered.

The littoral zone has given off colonists to the other three faunal regions. The entire terrestrial fauna has sprung from colonists contributed by the littoral zone. Every terrestrial Vertebrate bears in its early stages the gill-slits of its aquatic ancestor. All organs of aerial respiration are mere modifications of apparatus previously connected with aquatic respiration, excepting, perhaps, in the case of *Tracheata*, tracheæ being most likely modifications of skin-glands, as appears probable from their condition in *Peripatus*. The oldest known air-breathing animals are insects and scorpions, which have lately been found in Silurian strata. Prof. Ray Lancaster believes the lungs of scorpions to be homogeneous with the gill-plates of *Limulus*. Birds were possibly originally developed in connection with the seashore, and were fish-eaters like the tooth-bearing *Hesperornis*.

The fauna of the coast has not only given rise to the terrestrial and fresh-water fauna; it has from time to time given additions to the pelagic fauna in return for having thence derived its own starting-points. It has also received some of these pelagic forms back again, to assume a fresh littoral existence.

The deep-sea fauna has probably been formed almost entirely from the littoral, not in the remotest antiquity, but only after food derived from the *débris* of the littoral and terrestrial faunas and floras became abundant.

It is because all terrestrial and deep-sea animal forms have passed through a littoral phase of existence, and that the littoral animals retain far better than those of any other faunal region the recapitulative larval phases by means of which alone the true histories of their origins can be recovered, that marine zoological laboratories on the coast have made so many brilliant discoveries in Zoology during late years.

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## EDIBLE BIRDS' NESTS.

BY W. B. PRYER.

IN your number for August last year there are some remarks on the genus *Collocalia* (Three unpublished Papers by Blyth). I have lately noticed also several communications in 'Nature' and other publications on edible birds' nests and their makers; and as from these remarks it is apparent that there is still a good deal of uncertainty about the whole matter, the following observations may serve to clear up one or two doubtful points.

Is it true that the caves frequented by these Swiftlets are always near the sea? No; wherever these birds find caves adapted for their purpose, whether near the sea or far inland, they use them.

Are the nests ever spotted with blood? (Rev. J. Barbe). No; the cause of this theory is, no doubt, that some white nests, not of best quality, have a tendency to turn an unpleasant raw-flesh colour in their thick part—the stalk or part next the rock to which the nests are attached.

Are the birds particularly exhausted by the process of making the second nest, if their first is taken? (Rev. J. Barbe). I know nothing to favour such a supposition. I do not suppose they like having their nests taken, any more than a Thrush or a Sparrow does, but when their nests are taken before the young are hatched they simply go to work again and make another, even though it be for the third or fourth time, and the last made nest is just as good as the first, and is not spotted with blood.

Is it true that nests, clean at first, become when old deeply soiled and mixed with feathers (Blyth), and that "hence they are distinguished into white and black?" (Marsden). No; white nest is always white nest, and is distinguishable as such until it quite crumbles away; and black nest is always black nest, from the first commencement of its being made. Black nest always has a considerable number of feathers woven up in its composition; white nest none at all, or but one or two that are there by accident. I can show white nests that have been uncollected for four seasons, where the bird has made four successive nests, each on top of the remains of the last one; the oldest remnants, though crumbled away till there is but little left, are still almost as white



as when first made. If the above-mentioned theory were correct, of course the older nests ought to be black. On the other hand, I have seen thousands of black nests in all stages, from their first commencement up to their completion. Very lately I had under my observation a quantity of nests partly last season's make, partly this. The birds had returned to their old nests (which had not been collected), and utilized what remained of them, there being a rim of new (but black) material thrown round the old and partly decayed centre. Both rim and centre were unmistakably black.

The difference between the two classes of nest is at once to be seen. The quality—and consequently the price—of white nest varies considerably, from an almost pure white, crisp, thin nest,—which is valued as high as eighteen dollars, and even twenty dollars, a colley here,—down to thickish flabby nest, with the ugly raw flesh-stalk or foot, already mentioned, which is valued as low as two dollars a colley only, but is always to be recognised as “white” nest. Black nest varies, from the best quality,—known here as “manas,”—which is well shaped and crispish as a rule, but has feathers in quantities woven into their texture, and which is sometimes valued as high as one dollar and fifty cents a colley, down to the worst black, which may not be worth more than fifty or sixty cents a colley.

I know some caves in which the nest is always all white (of various qualities), others in which the nest is always all black (including manas), and others in which all qualities both of white and black occur. I am not prepared to advance any explanation for the reason of this at present, beyond mentioning that the natives say that there are two species of birds, the makers of black nests being chiefly distinguishable by their slightly larger heads from the makers of white. I have never noticed this distinction myself, however.

What is the truth of Marsden's statement as to the practice of beating down and destroying old nest in order that a greater proportion of white nest may be found next season? The fact is that if any nest is left uncollected, whether it be black or white, the birds next season will use as much as they can of the old foul and decayed nest, thus spoiling the new crop as well. If a new cave is found, though it can be seen at once if it is a white or a black nest one, the nest in it at the time of finding will not be of

much value, and it all has to be knocked down to ensure a crop of good quality next season, whether it be white or black.

Mr. Layard says that his experience is—if I understand him rightly—that the first gathering of a “crop” (*sic*) is white, the second black and feathery, and the third mixed with grass, &c. In this country, at all events, there is nothing of this sort; white nest is always white nest through all its seasons and gatherings, and black nest the same. The nests mixed with grass, &c., that Mr. Layard describes do exist, however. I have seen some that were brought from Palawan, which is so much mixed with grass and moss as to be valueless, but it is always the same, and though collectors were got over, and the caves thoroughly cleaned, with the hope of getting better quality at the next gathering, it was just the same, mixed with grass and moss as before. May not Mr. Layard have mistaken nest taken from different localities for successive collections from the same cave?

With regard to the material from which the nests are made, I regard the Algæ theory with great doubt. The natives say the birds skim up froth or scum from the water, and use it as the material. I myself think it is simply a natural secretion of the birds themselves. [But see Mr. G. Murray’s note, p. 147.—ED.]

There are still a great many points in connection with these Swiftlets that are very obscure, and which I have abstained from touching upon, but will endeavour to clear up as time goes on.

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## THE MOLLUSCA OF THE COUNTIES OF KENT, SURREY AND MIDDLESEX.

By T. D. A. COCKERELL.

(Continued from p. 180.)

### LIMNÆIDÆ.

*Planorbis lineatus*.—Very local, more common in East Kent than elsewhere. In Surrey it is found on Barnes Common; Middlesex and W. Kent (W. D. Roebuck). Knole Park (Smith).

Var. *albina*.—Near Deal (Mrs. Fitzgerald).

*P. nitidus*.—Ebbsfleet and Minster (S. C. C.); Chislehurst; Kew; Fulham; River Lea at Tottenham (C. Ashford).

*P. nautilus*.—Near Sevenoaks; Ealing; rejectamenta of River Stour at Richborough (S. C. C.); Mitcham Common (M'Kean).

Var. *crista*.—Near Sevenoaks, Acton, and other localities.

*P. albus*.—Rejectamenta of River Stour at Richborough; St. Mary Cray; near Dorking; Ealing.

[Var. *Draparnaldi*.—River Thames near Reading (W. Holland).]

*P. parvus* (= *P. glaber*).—Surrey, rejectamenta of Thames at Kew; Middlesex, in a private fishpond at Tottenham (C. Ashford); near Sevenoaks (Smith); Richmond (E. H. Rowe).

*P. spirorbis*.—Minster (S. C. C.); Beckenham; Bedford Park; Ealing; Surrey (M'Kean).

Var. *albida*.—Bedford Park (D. B. C.).

[Var. *ecarinata*.—Essex (Laver *vide* Rimmer).]

*P. vortex*.—Generally abundant. Canterbury (Miss L. Fenn); St. Mary Cray; Kew; Richmond Park (R. A. Freeman); Acton Green; Perivale.

*P. carinatus*.—Somewhat local. Rejectamenta of River Stour at Richborough; Crayford; Kew; Perivale.

Var. *disciformis*.—Guildford; Kew; Bushy Park (F. Fenn).

*P. complanatus*.—Common. Canterbury (Miss L. Fenn); St. Mary Cray; Kew; Guildford; Fulham.

Var. *rhombea*.—Stratford (Loydell and Rowe); Erith (Leslie).

Var. *albida*.—Eltham (Choules). Monst. *sinistrorsum*, Wye (Miss Hele). [Monst. *terebrum*, W. Sussex (Jeffery).]

*P. corneus*.—Common in Middlesex and East Kent, but otherwise somewhat rare. Minster; Canterbury (Miss L. Fenn); New Cross; Guildford; Kew; Ealing.

Var. *albinus*.—Minster; Kew; Fulham (Loydell and Rowe); Kingswood (McKean).

*P. contortus*.—Rejectamenta of River Stour at Richborough; Mottingham; Kew; Guildford; Acton Green; Ealing; Perivale.

Var. *albida*, Putney (Loydell and Rowe).

*Physa hypnorum*.—Bickley; Acton, scarce, usually found in ditches; Surrey (M'Kean).

*P. acuta*.—Tank in Kew Gardens.

*P. fontinalis*.—Herne Bay; St. Mary Cray; Richmond Park (R. A. Freeman); Perivale; Kew.

Var. *albina*.—Herne Bay; near London (Taylor).

[Var. *acuta* has been found in East Sussex.]

*Limnæa glutinosa*.—Rare. St. Nicholas Marsh; Minster

(S. C. C.). Sandwich and Deal (Mrs. Fitzgerald); Sittingbourne (A. Loydell); Barnes (Loydell and Rowe); Battersea, and on leaves of *Nuphar luteum* at Stanmore (Cooper).

*L. peregra*.—Very abundant. Minster; Canterbury (Miss L. Fenn); Bromley; Redhill; Acton Green, and many other places.

Var. *ovata*.—Minster; Perivale; Kew; Putney; &c.

Var. *acuminata*.—Putney; Ealing (S. C. C.)

Var. *intermedia*.—Shooter's Hill Road (Loydell and Rowe).

Var. *candida*.—Kent (Loydell and Rowe); Bushy Park, Middlesex (S. C. C.)

Var. *succinæformis*.—Kensal Green (Jeffreys).

Var. *labiosa*.—Bromley.

[Var. *lacustris*.—Brocket Hall Lake, Herts (W. Griffith).]

Monst. *decollatum*.—Chislehurst (D. B. C.); Barnes (S. C. C.).

Monst. *scalariforme*.—St. Mary Cray (L. M. C.).

*L. auricularia*.—River Lea at Tottenham (C. Ashford); Dover's Green, near Reigate (Saunders); Earlswood Common (M'Kean); Blackheath (W. Jenkins); Kingston; Bushy Park.

Var. *acuta*.—Kent (Jeffreys). Var. *magna*, Near London.

[Var. *ampla*.—W. Sussex (Jeffery).]

*L. stagnalis*.—Upper Deal; Chislehurst; Guildford; Kew; Chelsea; Perivale (S. C. C.).

Var. *roseolabiata*, Wolf.—Grove Park, Kent.

Var. *fragilis*.—Enfield (S. C. C.); Surrey and Croydon Canal (Jeffreys).

Var. *variegata*, East Kent (Fitzgerald). Monst. *decollatum*, Barnes. Monst. *scalariforme*, Chislehurst.

*L. palustris*.—Near Sarre; Canterbury (Miss L. Fenn); Witley Common; Kew; Ealing.

Var. *conica*.—Banks of the Thames from Hammersmith to Woolwich (Jeffreys).

Var. *albida*.—Sandwich; Minster (S. C. C.).

Var. *corvus*.—Folkestone (Mrs. Fitzgerald).

Var. *obesa*.—Faversham (Fairbrass).

Var. *disjuncta*.—Faversham (Fairbrass).

Var. *elongata*.—Kent (Loydell and Rowe).

Var. *tincta*.—St. Nicholas Marsh (S. C. C.). Var. *roseolabiata* is reported from Surrey and Middlesex. Monst. *globosum* (var. *globosa*, Taylor), Enfield (S. C. C.). Monst. *carinatum*, Bromley (S. C. C.). Monst. *decollatum*, Barnes.



*L. truncatula*.—Minster ; Chislehurst ; Croydon ; Kew ; Acton Green ; River Lea at Tottenham (C. Ashford).

Var. *albida*.—Battersea (Jeffreys).

Var. *major*.—Richmond (E. H. Rowe).

[Var. *elegans* and var. *microstoma*.—Hants (Jeffreys).]

*L. glabra*.—Near Hedgecourt Common (M'Kean) ; River Medway near Maidstone (Smith) ; Erith (Leslie) ; in a pond near Nine Elms, Battersea (Cooper).

[Var. *elongata*.—Near Colchester (Rimmer).]

*Ancylus fluviatilis*.—Enfield (S. C. C.) ; Barnes ; Redhill ; stream near Folkestone (Capt. Brown) ; River Cray near Erith (Leslie).

[Var. *albida*.—West Sussex (Jeffery). Var. *capuloides*, near Colchester (Rimmer).]

*A. lacustris*.—Bromley ; Lewisham (B. B. Woodward) ; Twyford, near Ealing (S. C. C.) ; Muddy lane, near Reigate (E. Saunders).

[Var. *albida*.—West Sussex (Jeffery) and Christchurch (Ashford). Var. *compressa*.—Colchester (Laver).]

#### TERRESTRIAL GASTROPODA.

*Arion ater*.—Type form (black). Near Wrotham ; Barnes (F. Fenn) ; Twickenham ; abundant on the banks of the Wandle at Waddon and the Wey at Shalford, also at Croydon Sewage Farm (K. M'Kean) ; near Southall ; Bedford Park (D. B. C.).

Var. *plumbea*.—Shiere and near Dorking.

Var. *nigrescens*.—Chislehurst and Bedford Park.

Var. *rufa*.—Chislehurst, Caterham, and Bedford Park ; north side of Cophthorne Common, in immense numbers (K. M'Kean).

Var. *succinea*.—"Of frequent occurrence (in Surrey), I can always take it in a ruined limekiln below White Hill" (K. M'Kean) ; Bedford Park.

Var. *pallidescens*.—Chislehurst.

[Var. *albida*.—E. Sussex (Jenner) ; Watford (J. Hopkinson).]

[Var. *albolateralis*.—Singleton, Sussex (W. Jeffery).]

*A. flavus*.—"A single specimen at the foot of a wall at Banstead. It measured three inches when extended ; in colour it was a dirty yellow, body and mantle, the sole of the foot being a little lighter ; no bands or markings" (K. M'Kean).

*A. sp.?*—Intermediate in size between *A. ater* and *A. hortensis* ; variable in colour, but usually orange-brown, with indistinct

lateral bands on body and mantle; tentacles dark grey. This form seems to be well distributed. I have found it at Haslemere, and quite recently at Chislehurst. I think that it will prove distinct from any of the other British Arions.

*A. hortensis*.—Near Reigate; Orpington; Chislehurst; Bedford Park.

Var. *grisea*.—Bedford Park and Chislehurst.

*Amalia gagates* var. *plumbea*.—Acton and Bedford Park. Mr. W. D. Roebuck informs me that this species has been recorded also for East Kent.

*A. marginata*.—Margate; Chislehurst; Bromley; Reigate Hill (E. Saunders); Sidcup; Battersea; Croydon (M'Kean); Bedford Park; Gunnersbury. There is a dark variety, almost black, which is not uncommon at Bedford Park and Acton, and I have taken one specimen at Kew. Curiously enough, all the Bedford Park examples I have examined have been without the usual internal shell, but the Kew specimen had the shell as in the type.

*Limax lævis*.—St. Mary Cray (S. C. C.); Barnes Common; Wray Common; Reigate Heath, &c. (E. Saunders); near Chipstead (K. M'Kean); Perivale; Ealing (F. Fenn); Twickenham. At Barnes there are two forms, one spotless and the other darker and mottled.

*L. agrestis*.—Very abundant throughout the district.

Var. *sylvatica*.—Perivale, Acton, Bromley, Croydon, Barnes.

Var. *tristis*.—Acton.

Var. *lilacina*.—Haslemere and Bedford Park.

*L. flavus*.—Margate; Chislehurst; Surrey (M'Kean); Acton; Bedford Park (S. C. C.).

Var. *grisea*.—Acton; Hampton Court; Bickley (S. C. C.).

Var. *virescens*.—Chislehurst.

Var.—Uniformly dark yellowish grey, without markings; mantle tinged with yellow anteriorly. Foot yellowish white. Ealing, May, 1885 (S. C. C.).

*L. maximus*.—Chislehurst; Haslemere; Croydon (M'Kean); East Kent (W. D. Roebuck).

Var. *maculata*.—Croydon (M'Kean).

Var. *obscura*.—Chislehurst; Willesden; Acton; Hampton Court; Bedford Park [Worthing.]

Var. *fasciata*.—Chislehurst and Bedford Park.

*L. arborum*.—Reported for West Kent, Surrey, and Middlesex.

Chislehurst (S. C. C.); Beech Woods at White Hill and Gatton (K. M'Kean); Wray Park (E. Saunders); Erith (H. Leslie). [South Essex (W. D. Roebuck).]

*Testacella haliotidea*.—Regent's Park, Hendon, and Hammer-smith (J. E. Harting); Stoke Newington (E. R. Allen); St. John's Wood (B. B. Woodward); Bedford Park; Acton (S. C. C.); Lambeth (G. B. Sowerby); Kensington (Miss S. Marshall); Hampstead (J. E. Harting); Kew (Rolfe); Mitcham, also abundant in the grounds of Coombe House, near Croydon (K. M'Kean); Wray Park (E. Saunders); East Kent (W. D. Roebuck). [Lewes (Hillman); Crabbe Wood, near Winchester (W. H. Cobbe).] Most, if not all, of the specimens belong to the var. *scutulum*.

*T. maugei*.—Kensington Gardens (British Museum). [Fareham, Hants (J. W. Cundall).]

*Succinea virescens*.—Minster (S. C. C.); St. Mary Cray (S. C. C.); Mitcham (Groves); Twickenham (F. Fenn); West Drayton (R. W. Cheadle).

*S. putris*.—Minster; Bromley; Putney (Loydell and Rowe); Acton Green.

Var. *olivula*.—Charlton (Hazay).

Var. *Fitzgeraldiana*.—Folkestone (Hazay).

*S. Pfeifferi*.—Near Faversham (Miss Fairbrass).

Var. *propinqua*.—Hammersmith (Hazay).

Var. *parvula*.—Barnes Common.

Var. *ventricosa*.—Folkestone (Hazay).

*S. elegans*.—Minster, large specimens (S. C. C.); St. Mary Cray; Tottenham (C. Ashford); Deal (Hazay); Richmond (E. H. Rowe).

Var. *minor*.—Hammersmith (Jeffreys).

Var. *ochracea*.—Southend, Kent (Rimmer).

Var. *intermedia*.—Near London (Cooper).

Monst. *sinistrorsum*.—Eastbourne (R. Rimmer).]

*Vitrina pellucida*.—Ebbsfleet; Orpington; Beckenham; Perivale; Barnes; Brentford (F. Fenn).

Var. *depressiuscula*.—Hastings (J. H. A. Jenner).]

(To be continued.)

ERRATA.—P. 96, line 15 for "Kent, M'Kean" read "Kenneth M'Kean." P. 96, "*Pisidium roseum*, Croydon Club District." This, the only Surrey record for *P. roseum*, is erroneous. The specimens were *P. pusillum*.

## NOTES AND QUERIES.

## MAMMALIA.

**Dormouse in Hampshire.**—In Mr. Rope's article on "The Range of the Dormouse in England and Wales," he says, "Reports from Dorsetshire and Hampshire are very meagre; perhaps this may arise from the commonness of the species rather than its rarity." The Dormouse is, or was, very common in this part of Hampshire. I have known as many as seventy or eighty in the College at one time, the boys not unfrequently carrying them about in their pockets; the price paid for them at the cottages was threepence or fourpence. The last year or two they have not been so plentiful; in fact, they have been scarce. We have a number of hazel copses, and generally speaking considerable numbers of Dormice are found when the underwood is cut, there being a large extent of beech and oak wood in our neighbourhood. "Old-man's-beard" is very plentiful in our hedges. Some years since I lived at Leighton Buzzard in Bedfordshire, and the Dormouse was frequently found by the woodman in King's Wood and Baker's Wood, about three or four miles from that town. The variety, or rather example, with a white tip to its tail is by no means rare, but is thought a good deal of by the boys, it not being the "common" mouse. It is not an unfrequent occurrence to see one of these little animals with a "stump" tail—that is, with part of the tail gone; they are said to bite their own tails off when kept short of water. Occasionally they show carnivorous propensities; we once had half-a-dozen in a cage, and were surprised one morning to find one of them dead with half of his head eaten away. I have at different times sent several Dormice through the post to my friends, and in every instance they arrived safely. I have seen an instance in which this little animal was so tamed that when at liberty in a room it would come to its owner when called, and would run up his body into his hand or on to his shoulder.—JOHN A. WILLMORE (Queenwood College, near Stockbridge, Hants).

## BIRDS.

**Pied Flycatcher and other Birds at Bolton.**—In the beginning of June I spent two delightful days at Bolton, in Yorkshire, attracted far more by the beautiful scenery of the River Wharfe than by the old Priory situated on its banks. Sketching by the river all one morning, I took up my position on a large boulder half-way out in the stream, where I was able to get an exquisite view and make myself comfortable, except for the numerous flies. Luckily there seemed an abundance of all sorts of birds,



a pair of Robins soon hopping inquisitively near me, who did their best to rid me of many of those small pests that buzzed about me. The male bird darted every minute at some large May-fly, flitted to the female, who received it with quivering wings, and then returned to his old place of "reconnaissance." The piping of a Water Ouzel attracted my attention at that moment. There he was coming down the stream towards me. A sudden cessation in his flight, and I had to look intently before I could discern his white breast, a few yards off me, as he took up his position on a moss-grown stone by the edge of the water, so closely did he resemble the surrounding mass of boulders and pebbles. The female in another minute put in an appearance. That these fascinating birds should be so destructive to the Trout is a thousand pities, for fishermen never hesitate to bring about their death in consequence. The Grey and Pied Wagtails were tippetting merrily about amongst the rocks, dabbling through the shallow pools and making fine meals. But I had no longer eyes for any of the above-mentioned, for at that moment a small black and white bird darted from a bough not eight yards from where I was sketching, seized a May-fly and returned to the tree. Without doubt I saw, for the first time in my life, a Pied Flycatcher at large; for I do remember seeing in an aviary at Wimbledon two pairs of these birds in perfect health and plumage, the property of a German, and brought over from Germany by him. However, my genuine wild Flycatcher at Bolton was more interesting, especially when his mate arrived also, and when, in a few more minutes, another male bird flew pugnaciously at him. They tussled for a second, and then the interloper took his departure a little way down the river, where I think he joined his lawful wife, for I fancied I saw her. The first pair stayed close to me the whole morning, appearing perfectly fearless, and once the cock bird flitted on to a rock, where he looked enquiringly at me, flirting his tail up and down all the time. Redstarts, Common Flycatchers, and a pair of Red-backed Shrikes also frequented what I may safely call one of the most lovely spots in England. Let us hope they will all, after safely rearing their young, return next year to add to the beauty and interest of Bolton.—HUBERT D. ASTLEY (Chequers Court, Tring).

**Ornithological Notes from Breconshire.**—On Whit-Monday (May 25th), when returning from fishing with one of my boys, I saw a Woodpecker which I cannot but think was the Great Black Woodpecker, *Picus martius*. I first heard the note of a bird, very loud indeed, in a tree, a large oak; it was exactly like the note of the Curlew when first disturbed, and quite as loud and totally unlike any Woodpecker's note I have ever heard before. A large black bird—certainly a Woodpecker—then flew out of the tree with a very quick flight. I only had just one glimpse of it, and could see it was larger than the Green Woodpecker, *Picus viridis*, and more

slender in shape; it flew with its tail forked. I heard its cry twice afterwards, but was unable to get another sight of it, and I saw it no more. Of its being a Woodpecker I have not the slightest doubt. Perhaps some of your readers who have heard the cry of the Black Woodpecker may be enabled to test the correctness of my surmise. It had a most resonant and startling cry, and I cannot do better than liken it to the note of alarm of the Curlew, omitting the "courlee" with which that bird always finishes. About a fortnight since a man picked up in a wood on a farm near Talgarth, in this county, a young Woodcock that was unable to fly; there were two others in the same spot. This confirms my idea that the Woodcock occasionally nests here, and I have found the same from the very early birds that are killed from time to time here, and which I have no doubt have been bred in this county. I had also last week the pleasurable opportunity of examining the Garganey, *Querquedula circia*, killed by Mr. Alfred Crawshay, and reported by him in 'The Field.' It is a female bird, and a nice specimen. It was killed on the old course of the River Usk, near Talybont, and was by itself. This old course of the river is now choked up with rushes and willows, and is an excellent place for all kinds of duck. The common Wild Duck breeds here every year. Mr. Crawshay tells me that he saw an Osprey, *Pandion haliaëtus*, last year at Llangorse Lake. It dashed down on the water several times, but he did not see it actually take a fish; this is the third occurrence of this bird, to my knowledge, in this county. While on this subject I may mention a most singular shot made right and left last winter by Mr. Crawshay at a flock of Goosanders, *Mergus merganser*; one barrel killed one and the other two old males in most splendid plumage. I saw the three stuffed. He tells me there were about eight in the flock, and finding he could not get near them he sent an attendant to drive them over his head, with the above result.—  
E. CAMBRIDGE PHILLIPS (Brecon, South Wales).

**"Humming" of the Snipe.**—When walking up the meadows on the 17th June last I heard a Snipe "humming." The sound was so peculiar that I stopped to discover, if possible, the cause. As the bird came round "humming" within twenty yards of me, I saw through my glasses that two or three feathers of one wing were wanting, and one or two also out of the other. The sound produced was quite a treble compared with the usual sound, which I fancy varies very little. In the afternoon I again heard the same bird, and as there was another with full wings "humming" at the same time, the difference was very marked. Several times both birds came within twenty yards, and I noticed that when the noise was made the tail was spread, the wings quivered, and the beak was closed.—The very great difference between the sound produced by the bird with the whole wings and that of the one with several feathers wanting fully satisfied me that the

humming sound is produced by the wings. The tail being spread steadies the bird in its downward flight, and may in some degree add to the sound. I had a good opportunity of seeing a Snipe perch. The bird came flying towards me and settled on some posts and rails which run along the side of a hedge in a meadow. After sitting on the rail for a few seconds it walked along the top, using its wings to steady itself, and hopped upon a post, where I watched it for a minute or two. I then walked towards it till within thirty yards when it took flight. After passing the rails a little distance the bird flew back, and with legs down tried to settle on the fence, a low trimmed one, but finding no foothold again pitched on the post and rail. I crept back under the shelter of the hedge, and on looking over found myself within a few yards of the bird, which was standing most comfortably on the same post; he soon began to preen his feathers, taking hold of them with his bill close to the gape and running them between the mandibles. In this way he could get hold of the feathers on the wing-coverts, when a movement on my part disturbed him, and we both went our ways.—J. WHITAKER (Rainworth Lodge, Notts).

**Curious Sites for Redbreasts' Nests.**—In the studio of Miss Currey, of Lismore, which is situated in the garden, a pair of Redbreasts commenced a nest this season behind a brass salver on a shelf within the apartment. The owner not permitting them to build there, they constructed a nest outside within a small watering-can that hung on a hook beside the door. On the lady taking down this article one day the bird flew out and the eggs rattled against the can, but on being replaced the Redbreast hatched them out a few days later and reared her brood in the can. Last year a Redbreast built in a fishing-basket hanging up in the same place. The bird used to enter beneath the half-opened lid, and to quit the basket by the hole in the top. After the first brood was reared, the Robin built a fresh nest within the basket and laid a couple of eggs, when a marauding cat terminated her life.—R. J. USSHER (Cappagh, Co. Waterford).

**Sparrows and the Crops.**—The House Sparrow is a curious fellow—full of originality—as bold a bird for his size as is to be met with anywhere. His usual habitat is, as his name implies, in the neighbourhood of houses, chiefly towns or farms. In the towns there are always scraps to be thrown away, in the country the farmyards afford sustenance to the Sparrow; often in the former case, however, to the discomfiture of numerous half-starved cats that abound in urban districts. It seems odd, too, that although there are laws and what not for the protection of most of our birds and beasts, yet very little is thought about the thousands of cats that must die every year, in London alone, of starvation. Well, our present thoughts are not now with the cat, but that most republican of birds, the Sparrow. The Sparrow is a native of our isle, and he seems somehow to inherit the

independent spirit which, at one time at any rate, was the boast of Englishmen as peculiar to the British race. He is gregarious by habit, building his nest in colonies, his favourite place being either the eaves of buildings or thatch of barns; if numerous, however, they will build in evergreen trees and shrubs, such as the spruce-fir or Portugal-laurel. The nest, if built in the open, is circular-shaped, with an entrance at side, whilst it is often more or less rudimentary when built under the sheltering roof. The first sound that greets the dweller either in town or country in the early morning, and one of the last as evening draws on, is the endless chatter of the Sparrow, for he—unlike most of our sombre-coloured birds—possesses no pleasing song with which to beguile the hen during the days of incubation. What all their conversation can be about would tax the most imaginative of mortals to determine, for the ordinary listener the distinguishing feature of their parliamentary wrangles seems to be repetition. They remind me very much of a number of almshouse gossips, whose sole aim appears to be to hear their own voices, to attain which it is necessary for all to speak at once. The Sparrow, however, is not always chattering, for he is a good forager; a veritable gourmand is he—few things come amiss to him, from the corn in fields to the cherries on the wall; with his powerful beak he shells the peas with wonderful celerity, and when detected will fly to the nearest wall and chirrup a bold defiance, as if he delighted in a spice of danger. Watch him as he approaches the hens just fed with scraps from the table: in vain the cock—proud possessor of numerous wives—lets drive at him. No good, for he returns again and again until at last he seizes in his beak the object of his desire, perhaps a piece of turnip half as big as himself—quickly to be dropped, however, as some more palatable morsel is discovered. We have two or three cats here that feed regularly with the fowls; numerous Sparrows, of course, are there to pick and steal, as is their wont. It is a curious fact that the cats make no attempt to interfere with the Sparrows while feeding, the birds often feeding within springing distance. When Sparrows are numerous and food scarce their pugnacious nature asserts itself; if, however, two hen Sparrows should disagree, the general result is interference by some old male bird who has probably won his spurs in many a hard-fought tussle, in right of which he lays claim to decide upon the merits of the case, but if the cocks delight to fight and scratch, the hens will look on with indifference. I have seen Sparrows attack and drive away Starlings, even from the places where the latter had selected to nest. Around this house and buildings Swallows can get no place for their nests, owing to the fact that as soon as a nest is completed, the Sparrows in the calmest way possible take possession. The Sparrow being a bird of social habits will, if encouraged, become tame, although, like most bipeds of bullying propensities, they are naturally suspicious, and will not as a rule, unless pressed by hunger, venture within



the window; whereas there are many other kinds that will become very friendly by encouragement. I remember this last winter—by no means a severe one—a case of a Robin that used to sit on a stag's head in the dining-room here and sing whilst breakfast was going on, becoming so friendly at last that one morning he pounced from his "coign of vantage" and seized a pat of butter from my plate, which, however, soon slipped off his beak, much to his astonishment. Well, I must now draw my remarks on this best known of English birds to a conclusion. I much fear, however, that a hard time is coming for the country Sparrow, for he has increased so of late years, and the damage done by him to the cornfields is so great that the farmers, for the sake of their crops, will have to take steps to keep them within reasonable limits.—HERBERT GOW STEWART (Hole Park, Rolvenden, Ashford).

**Jackdaws breeding in a Magpie's Nest.**—In reply to Mr. Warren's enquiry (p. 264), I may state that I have got a clutch of Jackdaw's eggs taken on the 18th April, 1883, from an old Magpie's nest in a Scotch fir near a farmhouse of mine. The Jackdaw was said to have bred there before. For several years past a colony of these birds have bred in an old Rook's nest in the dense top of a tall spruce-fir near my house here, the Rooks having deserted this place. They seem to prefer this site to the chimneys.—R. J. USSHER (Cappagh, Co. Waterford).

**Hybrid Wild Geese.**—At p. 256 of 'The Zoologist' for 1883 is a notice of a supposed hybrid Wild Goose—a cross between a Bean and a White-fronted Goose, as I then considered it. The bird has now moulted into the ordinary plumage of a White-fronted Goose, though from the comparatively small amount of black on the under parts it seems to be not yet adult. It is evident therefore that my supposition was quite wrong, and it was only the immature plumage which misled me. Young White-fronted Geese may be constantly seen with the nail or "bean" on the mandible partly black, but in this example the whole beak was so very unlike what it ought to have been that I was led into the mistake of suspecting a hybrid origin. About the time that this goose was purchased in Leadenhall Market, Mr. Castang, of whom it was obtained, had another, which came from Holland, and was believed by him to have been bred in confinement. Judging from its appearance this bird, which was subsequently bought by my father, could be nothing else than a hybrid between a Grey-lag and a Bean Goose. The whole of the nail on the upper and lower mandible is black, the rest of the bill and the legs being a very pale flesh-colour. There is a certain amount of black on the under parts, but not much, and a good deal of white all round the base of the bill, or on the face, as I might term it. The lesser wing-coverts and region of the carpal joint are as grey as in any pure-bred Grey-lag. The bird died the other day, and this description was written down

from it while in the flesh. On dissection it proved to be a female.—J. H. GURNEY, jun. (Northrepps, Norwich).

**Greater Shearwater on the Skye Coast.**—While engaged in searching for *Puffinus anglorum*, on the west coast of Skye, on July 13th, I had the good fortune to discover a dead specimen of the Greater Shearwater, *P. major*, lying on a heap of torn sea-weed among the rocks. Probably it had been cast up by a N.W. gale on July 11th. The light was then too grey to admit of a thorough examination of the bird, and I have been walking ever since I found it until now; but even in the shade of the glen it was easy to decide its identity by a glance at the fairly powerful bill, the long toes, and the expanse of wing. The soft parts resemble those of *P. anglorum* (the irides have sunk); but the webs of the toes are paler than in our common Shearwater. It will make a nice skeleton.—H. A. MACPHERSON (Carlisle).

**Swallows building in Caverns.**—Since I was a boy, over thirty years ago, I have known a few Swallows, *Hirundo rustica*, to build against the roof of a large limestone cavern near this, where good light reaches them. I have recently seen instances of Swallows breeding both there and in another smaller cave. House Martins are rather local here, breeding chiefly in colonies under over-arching sea-cliffs.—R. J. USSHER (Cappagh, Co. Waterford).

**Birds Breeding in Ants' Nests.**—The Southern Chestnut Woodpecker, *Micropternus gularis*, always, as far as I have observed, uses an ants' nest to nest in; and Mr. Gammie, the Superintendent of the Government Cinchona Estates at Mongphoo, near Darjeeling, has noticed the same thing with regard to the allied northern species, *Micropternus phaeiceps*; and the peculiarity probably extends also to the allied species found in Burmah, Siam, &c. Mr. Gammie thinks that when an ants' nest has been taken possession of by the bird that the ants desert the nest. This is a point on which I cannot speak with certainty. Mr. Gammie has taken nests of the northern species in which, although the bird has laid, the ants remained, and he has taken other nests where not a single ant remained; but there is nothing to show that these nests were not deserted before the bird took possession. I myself have taken nests of the southern form, in which, though the eggs were partially incubated, the ants remained, showing that some considerable time must have elapsed since the bird took possession. This is a point that I hope to be able to elucidate within the next few months, when the birds will be breeding. When *Micropternus* is breeding, the feathers of the head, tail, and primaries of the wings get covered with a viscid matter, having a strong resinous smell, and this substance is usually rather thickly studded with dead ants (*vide* 'Stray

Feathers,' vol. vi., p. 145). Two species of Kingfishers also to my knowledge nidificate in ants' nests—viz., *Halcyon occipitalis* confined to the Nicobar Islands, and *H. chloris*, which ranges from India as far south as Sumatra. At Mergui, in South Tenasserim, I found a nest of *H. chloris* in a hornets' nest; and although I saw the birds repeatedly enter the hole they had made in the hornets' nest, the hornets did not seem to mind it, but they resented in a very decided manner my attempt to interfere with the nest.—WM. DAVISON, in 'Nature.'

**Curious Nest of the Song Thrush.**—On Whit Monday, May 25th, I found, in the Copgrove Woods, Boroughbridge, a Song Thrush's nest, which to me, and to other members of the Yorkshire Naturalist's Union (who were having an excursion there that day), seemed very curious. It was placed among a number of young shoots, covered with green leaves, springing from the bole of a tree, and was formed on the outside entirely of fresh green shoots and leaves of low-growing plants, the rim at the top being of perfectly fresh blades of grass. With the exception of the dung lining everything visible about it was green, and the contrast to the ordinary nest of this bird formed of dry withered material was most marked. No doubt it was done for greater concealment among the surrounding green leaves, the colour of which was exceedingly well matched, except for the dulness of the nest caused by the withering process, and which would, of course, increase every day. Whether the bird had itself plucked off the fresh shoots, or they had been thrown out of the gamekeeper's garden, which was some fifty yards away, I cannot say. The nest contained one egg.—G. T. PORRITT (Greenfield House, Huddersfield).

#### FISHES.

**Spinous Shark in Galway Bay.**—On June 26th a large Spinous Shark, *Echinorhynchus spinosus*, said to have measured nine feet, was captured in Galway Bay by some fishermen, who reported that another was, at the same time, seen accompanying it. This is the second known Irish example, and the first taken on the west coast, the former instance having occurred in September, 1882, when one of these rare Sharks was caught off Skerries, near Dublin (see Zool. 1882, p. 424). The head and portion of the tail of the present specimen have been secured for the Science and Art Museum. From Mr. Michael Alfred, of the 'Galway Express,' I learn that, on the 4th of July, a second specimen of this rare Shark was captured by some Claddagh fishermen outside the Aran Islands. It was about eight feet in length; and, like the latter, was taken on a handline used for conger eels, the bait being a gurnard without the head. Depth of water about thirty fathoms. Mr. Alfred adds that three have been caught within ten days.—A. G. MORE (Science and Art Museum, Dublin).

**Rare Fishes off Aberdeen.**—I recorded and figured in the 'Proceedings of the Zoological Society' for 1884 the first species of *Lumpenus lampetiformis* obtained in Great Britain. It was a male 10.7 inches long, captured trawling by Prof. M'Intosh, fifteen miles off St. Abb's Head. On June 20th I received a letter from Mr. Sim, of Aberdeen, inclosing a sketch of a fish which had become entangled in the net of a steam trawler, and which specimen he was good enough to forward for my inspection. It is a female of the same species 8.6 inches in length, in which the caudal fin differs from that of the male example in that its form is lanceolate. The second specimen, which I received at the same time from Mr. Sim, was that of a *Gadiculus argenteus*, Guichenot, which was cast up on the beach after a slight storm on the 13th April last. To this latter fish a considerable amount of interest attaches itself. Pertaining to a genus whose habitat is considered intermediate between the littoral and deep-sea zones, I have been in doubt whether it has or has not been previously obtained off our shores. Couch labelled a fish of this species from the 'Porcupine' Expedition as *Macrourus linearis*, and which is in the British Museum collection. Of it he wrote as follows:—"Much resembling a Whiting, but shorter in proportion to its depth and with a much larger eye. Caught from a depth of 183 fathoms, muddy ground, 54° 10' N. and 10° 59' W. Length about six inches; no barb; the head short, eye large, mouth capacious, teeth small, dorsal fins three, anal two, tail a little concave, colour in spirit pale yellow. If we can suppose that a Whiting can live at such a depth, we can suppose also that the eye might become larger and the body rather shorter, proportionally, but otherwise it is a distinct species and yet nearly alike; but from the latitude, and especially the longitude, it is scarcely a British fish." I should have deemed a fish from such a spot undoubtedly British, but as I was not quite sure whether Mr. Laughrin, who had been in charge of the fish collection in the 'Porcupine' Expedition, might not have inadvertently mixed up Mediterranean forms with those from higher latitudes, and as *Gadiculus argenteus* originally was obtained from the coast of Algiers, I wrote to him on the subject. However, he would only reply that "I do not think he [Mr. Couch] had any of the Mediterranean fish; I cannot remember, it is so long ago." It is very interesting being able, after so many years' interval, to adduce corroborative evidence as to this fish being entitled to a position in the British fish-fauna, the 'Porcupine' specimen having been obtained on the west coast of Ireland, Mr. Sim's on the east coast of Scotland. The specimen is 3.3 inches in length, D. 11/13/15, A. 16/16, L. 1. 56. There is a dark spot at the base of the anterior rays of the first and second dorsal fins.—FRANCIS DAY (Cheltenham).

**Dentex vulgaris in Mount's Bay.**—I received this morning (11th July), two hours after capture, a small but very good specimen of the



Four-toothed Sparus, *Dentex vulgaris*, taken in Mount's Bay. The most striking characteristic was the beautiful mother-of-pearl appearance of all the scales. Over the back above the lateral line they were rosy pink mottled with blue, on the sides pink, gradually becoming white on the belly. The distinctive teeth were present, recurved, and—what I do not observe noticed in the books—grooved throughout their length, thus giving an appearance of great strength. The jaws were so rigid that I had some difficulty in opening the mouth, suggesting great power in the muscles which worked them. The eye was high in the head, and, for one of the *Sparidae*, small. The scales were large, and there were none on the nose, nor on the suborbital space. Its dimensions were:—Length over all, 1 ft. 6 in.; eye to fork,  $11\frac{7}{8}$  in.; greatest depth at the base of dorsal,  $5\frac{1}{2}$  in.; breadth, 2 in.; length of pectorals,  $4\frac{1}{2}$  in. The lateral line started from the top of the operculum in a curious agglomeration of small scales,—not exactly a spot, because they were of the same colour as the other scales,—and was very conspicuous throughout its whole length, but was scarcely perceptible to the touch. In the dorsal fin the third ray was the longest of the spinous rays. Couch makes the fifth ray longest, but he is mistaken, and so is Yarrell in putting a small rudimentary ray in front of the dorsal. The caudal fin was a very powerful one. The specimen turned the scale at two pounds seven ounces. The fish had a remarkably strong smell, which communicated itself to one's hands on examining it. The specimen will be lodged in the museum at St. Michael's Mount.—T. CORNISH (Penzance).

#### ARCHÆOLOGY.

Folk-lore anent the Weasel.—In the 'Vicar of Wakefield,' Oliver Goldsmith puts into the mouth of Dr. Primrose the following curious expression, "My wife was usually fond of a weesel-skin purse, as being most lucky; but this by the bye." Can any correspondent explain the allusion? Why was the "weesel-skin" considered lucky? and is the notion still prevalent?—J. E. HARTING.

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#### NOTICES OF NEW BOOKS.

*A Naturalist's Wanderings in the Eastern Archipelago: a Narrative of Travel and Exploration from 1878 to 1883.* By H. O. FORBES, F.R.G.S. 8vo, pp. 536. London: Sampson Low & Co., 1885.

ALTHOUGH the writings of Mr. A. R. Wallace have admirably paved the way in describing the characteristic fauna and flora of  
ZOOLOGIST.—AUGUST, 1885.

some of the islands in the Malay Archipelago, there is yet very much to be done in the way of exploring and collecting there before our knowledge on the subject can be considered as anything like complete. A valuable contribution thereto has been recently published by Mr. H. O. Forbes in the shape of a narrative of five years' wanderings in Java, Sumatra, the Cocos Keeling Islands, and Timor Laut; and, as might be expected, this narrative is full of interest for naturalists.

Proceeding first to Java he made Batavia his head-quarters, whence all necessary supplies could be procured, and his collections stored at the end of every expedition. After a brief stay here, which carried him over the worst part of the rainy season, he started early in 1879 for the Cocos Keeling Islands, in order, as he tells us, to form, by personal observation, more clear ideas of coral formation, and chiefly to note how the struggle between the reef-makers and the waves had been going on since the date of Darwin's visit there in 1836, when he made the observations subsequently published in his 'Coral Reefs.'

Returning thence to Batavia, he started soon after for Genteng, in the province of Bantam, where he spent some time in collecting; afterwards proceeding to Kosala, whence, after some months' absence, he returned to Batavia to pack up and send home his first collections. This accomplished, he began to look further afield, and in November, 1880, embarked for Telong Betong, the chief town of the Lampong Residency, which forms the most southerly province of Sumatra, steaming westward through the Thousand Islands into the Straits of Sunda, and so into Lampong Bay.

After a brief sojourn in the south-coast district of the Lampongs, once more he returned to Batavia to despatch collections, and again entered Southern Sumatra to explore the dense forests which clothe the great mountain chain extending through the Residency of Lampong, beyond that of Palembang. Here a year was adventurously and profitably spent, and it was not until the middle of April, 1882, that he once more left his head-quarters at Batavia, *via* Amboina, for Timor Laut, full of great expectations in regard to a group of islands of whose fauna and flora he was to give the first published account. The exploration of these islands, not unattended with danger and difficulty, occupied the remainder of the year 1882, when, after

an expedition to Buru and another to Timor, the traveller returned to England in August, 1883, after an absence of very nearly five years.

Such is a brief outline of the author's route, the full details of which he has described very pleasantly in the volume before us. We need scarcely say we have read it with a great deal of interest, and marked a good many passages for quotation, many more, indeed, than we here have space for.

During his sojourn on the Cocos Keeling Islands Mr. Forbes had good opportunities for observing the singular habits of the great Cocoa-nut Crab, *Birgus latro*, which is to a great extent nocturnal in its habits, making tunnels in the ground larger than rabbit-burrows, which it lines with cocoa-nut fibre. It feeds almost exclusively on fallen cocoa-nuts, using its great claw to denude the fruit of the husk surrounding it, and to get at the eye of the nut, which it has learned is the only easy gateway to the interior. Mr. Forbes thus describes the mode of operation :—

“Of the three eye-spots seen at the end of a cocoa-nut, only one permits an easy entrance. The *Birgus* does not waste its energies in denuding the whole nut, and it never denudes the wrong end. Having pierced the proper eye with one of its spindle ambulatory legs, it rotates the nut round till the orifice is large enough to permit the insertion of its great claw to break up the shell and triturate its contents, whose particles it then carries to its mouth by means of its other and smaller cheliferous foot. From this nutritious diet it accumulates beneath its tail a store of fat, which dissolves by heat into a rich yellow oil, of which a large specimen will often yield as much as two pints. Thickened in the sun it forms an excellent substitute for butter in all its uses.”

Mr. Forbes also discovered it to be a valuable preserving lubricant for guns, and steel instruments; and only when a small bottle of it which he had had for two years was finished did he fully realise what a precious anticorrosive in these humid regions he had lost.

The mammalian fauna of the Keelings appears to be entirely an introduced one. A herd of deer on Horsburgh Island is interesting, as being a cross between the Javan *Rusa*, *Cervus hippelaphus*, and the darker Sumatran species, *Cervus equinus*. Pigs run wild, and thrive remarkably well on the broken scraps of cocoa-nut everywhere lying about in the woods. Australian

sheep feed on the *Portulaca oleracea*, on a kind of grass, and on the tubers of an aroid which they scrape up, and seem none the worse for the maritime conditions under which they are forced to live. Rats are a perfect nuisance. Occasionally Flying-foxes (*Pteropus*) reach the atoll, but generally in too exhausted a state to survive.

Bird-life in the Keeling Islands is described as "limited, but very interesting." The Noddy Tern, *Anous stolidus*, and the Gannet, *Sula piscatrix*, were seen in thousands, and the author had many opportunities of noting how their industrious habits are taken advantage of by the Frigate-bird, *Tachypetes minor*, much in the same way as we see our British Gulls pursued by Skuas.

The Philippine Rail, *Rallus philippensis*, which is resident in the Keelings, becomes quite domesticated, and is employed by the colonists to hatch out their chickens, which it does with care.

While travelling in Java, one of the author's most interesting discoveries was a Spider, *Ornithoscatoides decipiens*, Cambridge, remarkable for its exact resemblance to the droppings of a bird, a resemblance which is increased by its spinning a thin white web on the surface of a leaf, by means of which it secures itself on its back to the leaf, leaving its legs free to enclose and seize any insect unwittingly resting upon or crossing the apparently harmless bird-dropping. This very curious spider was afterwards met with again in Sumatra.

In the forests on the southern slopes of the Malawar and the Wayang, the Banteng, *Bos banteng*, lives in considerable herds, but is very difficult to approach and dangerous when wounded. The baying of Wild Dogs often reached the traveller's ear, but they were so exceedingly shy and wary that he only succeeded in shooting one indifferent specimen. These Wild Dogs, it appeared, live chiefly on the Kantjil and Muntjac deer. Civet Cats were found to be abundant in Java, and the nocturnal Scaly Anteater, or Pangolin, was captured in the evening while clumsily climbing trees, licking up with amazing rapidity streams of ants, which form its sole food.

Amongst other interesting birds collected in the province of Bantam were a Flycatcher, *Siphia banjumas*, of a beautiful azure blue; a sea-green Magpie, *Cissa thalassina*, with brown wings,



coral beak and legs ; and a handsome Shrike, *Laniellus leucogrammicus*, known only from Java.

In the forests of Sumatra Mr. Forbes added to his collection some of the fairest of the feathered tribes—a crested Bee-eater, *Nyctiornis amicta*, with rose-coloured head and vermilion throat ; orange and scarlet-crested Woodpeckers ; green Barbets, blue and bronze Doves, green and scarlet twittering Lories ; and, on the dead snags of the lonely outliers, large hawks and falcons. Amongst the Mammalia his most interesting capture in Sumatra was a Flying Squirrel (*Sciuropterus*), with large gentle Lemur-like eyes, soft fur, and black-margined parachute expansions. Butterflies were numerous and beautiful, none perhaps more so than the lovely *Amblypodia eumolopus*, the upper sides of whose wings are of the most sparkling emerald.

Of the Natural History of Timor-laut previous to Mr. Forbes' visit hardly anything was known. If we except birds, animal-life seems to be but poorly represented. Besides a *Cuscus* (a genus of Marsupials common to the Moluccas and New Guinea) and a wild pig, Mr. Forbes found no large indigenous mammals, although, so far as native tradition goes, the herds of Buffaloes which live in a wild state on the mainland are believed to be indigenous. Mr. Forbes, however, considers it more likely that they have been brought there by the accident of shipwreck, or by design. No Deer were seen or heard of, no Kangaroo, and no Squirrels ; a few small insectivorous Bats, one fruit-eating Bat, and a small mouse-like animal (*Perameles*) were all that were observed, although the Dugong, *Halicore australis*, frequents the shore, and is hunted by the natives for its ivory.

One species of Frog was collected, while Snakes and Lizards were found in considerable numbers, one species of each proving to be new to science. Out of sixty species of birds collected on Timor-laut no less than twenty were new ; and of the butterflies and other insects brought home from here nearly one half were previously undescribed.

With this glance at its contents we must close Mr. Forbes' volume, though we should like to have quoted much more from it. It is extremely interesting from beginning to end, and is quite the best Natural-History book of the season.

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*The Birds of Lancashire.* By F. S. MITCHELL. Post 8vo, pp. 224.  
London: Van Voorst. 1885.

It has been for some time known to ornithologists that Mr. F. S. Mitchell has long had in preparation a volume on the birds of the county in which he resides; and it has just been published. Considering the vast increase of population in Lancashire, and the scientific farming which drains every marsh, and substitutes for every bosky nook a rigid bank and paling, it is astonishing how many different species of birds Mr. Mitchell has been able to enumerate as still resident in the county or occasionally visiting it.

He tells us that the present avifauna comprises 256 species, of which eighty-five are residents, thirty-one summer visitors, sixty-five winter visitors, and seventy-five occasional visitors. The residents are all annual breeders within the county limits, except the Lesser Black-backed and Herring Gulls, but as these nest within a very short distance of the border they may be fairly included in the class. The Peregrine Falcon, Common Buzzard, Hen Harrier, Nuthatch, Goldfinch, Raven, Rock Dove, Water Rail, and Spotted Crake, probably all still breed in Lancashire, though in much diminished numbers. The summer visitors also all breed annually, although the Pied Flycatcher, always local, is now considered rare.

"Among the winter visitors," says Mr. Mitchell, in his Introduction, "is placed the Crossbill, which once bred regularly in the county, and possibly still does so occasionally, as also are those species like the Dotterel, Greenshank, and Turnstone, which appear on migration in spring and autumn, and those like the Guillemot, which occur the summer through, but never remain to breed." Upon this paragraph we have to remark that when treating of the Crossbill further on (p. 69), Mr. Mitchell has omitted to furnish any evidence of its having "once bred regularly" in the county; nor do his remarks concerning the Dotterel, Greenshank, Turnstone, contain any allusion to their occurrence in winter. On the contrary, he shows that in Lancashire, as elsewhere in England, they are all of them spring and autumn migrants, going northward to breed in the spring, and returning southward with their young

in autumn. It must have been surely by inadvertence that Mr. Mitchell has included them amongst winter visitors in his Introduction.

Referring to the occasional visitors, amongst which we presume are to be included the rare and accidental stragglers, Mr. Mitchell notices the Roseate Tern, which not many years ago was a regular summer migrant, and which, though seemingly extinct, he has been "reluctant as yet to cut out altogether."

The two rarest birds which have occurred in Lancashire are those of which two excellent coloured plates are given, namely, the Black-throated Wheatear (*Saricola stapazina*), and the Wall Creeper (*Tichodroma muraria*). The former was shot in May, 1875, near the reservoir at Bury; the latter was obtained in May, 1872, at Sabden, a village at the foot of Pendle Hill. The abundance of the Twite in Lancashire is noteworthy considering how scarce a bird it is considered in more southern counties. Mr. Mitchell describes it as "resident, occurring on open moorlands, and breeding as commonly on the South Lancashire mosses as in more elevated districts. It leaves the higher grounds in winter, and approaches the towns, feeding in company with its congeners, in considerable flocks, on the stubble fields and waste lands."

Referring to the marked decrease of the Wood Lark (p. 86), Mr. Mitchell states that, although once a common resident in many parts of Lancashire, it is now almost extinct. He adds that this appears to be the case generally throughout the north of England, and probably the incessant pursuit of this species by the professional birdcatcher has a good deal to do with its increasing scarcity.

We are surprised to notice the statement, on page 117, that the Hobby, a summer visitor to this country, has been procured in Lancashire *in winter*. This, probably, is a mistake, and, no particulars being given, it is not unlikely that the author's informant may have mistaken a young Merlin for a Hobby.

Amongst species which are absent from Lancashire are noticed the Nightingale, Dartford Warbler, Bearded Titmouse, and Thickknee, while some others, like the Nuthatch, though plentiful in other parts of England, are said to be "exceedingly rare and very seldom seen."

We have no faith whatever in the validity of the so-called species, *Parus britannicus* and *Acredula rosea*, both recognized by Mr. Mitchell. Between these and *Parus ater* on the one hand, and *Acredula caudata* on the other, no end of intermediate forms occur, which entirely destroy the importance of the characters relied on by those who are fond of persuading themselves that they have discovered a new British bird. It is true that the difference of coloration between *Acredula rosea* and *caudata* is much more marked than in the case of *Parus britannicus* and *ater*; so much so, indeed, that on a comparison of well-marked specimens of both forms, *rosea* would seem entitled to specific rank; but Herr von Tschusi zu Schmidhoffen, who has recently written upon the European Longtailed Tits (Mittheil. Orn. Verein, Wien, 1884, p. 103), states that in the district of Salzburg not only do both *rosea* and *caudata* appear, but also every possible form intermediate between the pure white-headed and the black-striped birds.

As an interesting example of the way in which changes in cultivation will affect the avifauna of a district, we may refer to the account which is given (p. 165) of the introduction of Black Game into Lancashire. This bird seems to have followed the larch plantations, and Mr. Pearson, in tracing its present distribution in the county, says, "It is remarkable that within the period of my memory the summit of Cartmel Fell, then a healthy waste, was tenanted by the Red Grouse; it is now a larch forest occupied by Black Grouse."

A very commendable feature in Mr. Mitchell's book is that the remarks made on the habits of the various species are the result of independent observation, and in all cases have a local bearing. It would, of course, have been easy to double the size of the volume by giving full descriptions of plumages, nests, and so forth, or by copying from the works of predecessors; but Mr. Mitchell assures us, in his Introduction, that his facts are all derived from original sources. His book forms a most acceptable addition to the steadily increasing series of county avifaunas.

